A Dual Assimilation System for Satellite Altimetry

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An ocean data assimilation system is being implemented so as to
estimate the time-evolving, global, three-dimensional state of ocean
circulation. The assimilation system consists of a dual approach
based on an approximate Kalman filter and the adjoint method. The
system is designed so as to provide routine analyses by the Kalman
filter and periodic reanalyses by the adjoint method. The Kalman
filter will also provide quantitative error estimates that will be
used in defining the weights in the adjoint optimization, and the
adjoint method will be employed to further optimize model parameters.

The model is of reasonably high resolution and is based on the
parrellel version of the MIT general circulation model; The model is
global and has a telescoping meridional grid with a 1/3-degree
resolution in the tropics that gradually increases to a 1-degree
resolution away from the equator. The model has 46 vertical levels
with 10m resolution near the surface and employs advanced mixing
schemes (KPP and GM). The Kalman filter is based on a new
approximation that consists of a hierarchy of reduced-state filters,
each of which resolves particular aspects of the model uncertainties.
The model adjoint is generated by the Tagent linear and Adjoint Model
Compiler and employs a conjugate gradient algorithm in the
optimization. Both approaches assimilate temporal sea level anomalies
measured by TOPEX/POSEIDON. The adjoint method further employs
Levitus's climatological hydrography and NCEP's reanalyzed surface
fluxes in its constraints. Results from the assimilation will be
presented along with an analysis of the nature of the model
improvement and issues related to residual model-data misfit.